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STUDIES ON THE PLECOPTERA OF NORTH
AMERICA: V. NOTES ON ISOGENOIDES.¹

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Since the publication of a study on *Isogenoides* in The American Midland Naturalist in 1943, a new species has been discovered and a further study of *I. hudsonicus* Hanson has been conducted in view of the synonymy of this species under *I. frontalis* by Ricker.

***Isogenoides zionensis* n. sp.**

Fig. 3.

Coloration and structural details typical of *Isogenoides* as discussed in Part III of the author's American Midland Naturalist series.

Male.—Length of body, 13–17 mm.; wings 4–5 mm. long, brachypterous, extending only to fourth or fifth abdominal segment.

Abdominal segments 6, 7, and 8 with dorsolateral humps smaller than those of such species as *I. frontalis*. No nail present on 7th sternite. 9th sternite only very slightly produced backward, less so than in other known species of the genus. Genital lobes of 10th segment large, broadly rounded, with a tendency toward desclerotization anteriorly; covered with numerous short, fine setae which are interspersed with a few spine-like setae especially in the anterior apical region. Supraanal process elongate, flattened, curved forward, and mostly membranous apically; posterior sclerotized support tapering to a needle-like point and reaching apex of the supraanal process; anterior support branched near the middle of the supraanal process into three arms which extend only part

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way toward the apex of the supraanal process. Lateral stylets attached to base of supraanal process; with basal region strap-like and imbedded in membrane; with apical region free, blade-like, slightly longer than broad. Paragenital plates convex, well sclerotized, similar to those of other species of the genus. Subanal lobes moderately large, and partly covered with short setae.

Collection Data. Holotype male—Zion National Park, Utah, altitude 4500 ft., June 21, 1942 (C. P. Alexander). Paratopotypes—4 males, June 22, 1942. All types are in the Hanson collection.

This species resembles *I. elongatus* which is similarly brachypterous, which has rounded genital lobes, and sometimes has no discernible nail on the seventh abdominal sternite. However, the genital lobes of *I. elongatus* are narrower, its lateral stylets are much longer, and its supraanal process is greatly different in shape from that of *I. zionensis*.

Isogenoides hudsonicus Hanson

Fig. 1.

1942. *Isogenus frontalis*, Frison, Bull. Ill. Nat. Hist. Survey Vol. 22, art. 2: 290–292, fig. 59 (in part).

1943. *Isogenoides hudsonicus* Hanson ♂ ♀, Amer. Midl. Nat. 29, no. 3: 662–663, figs. 7, 17, 18.

1944. *Isogenoides frontalis*, Ricker, Canad. Ent. 76: 181 (in part).

This species was recently synonymized by Ricker under *I. frontalis*. In my opinion, differentiation of the two species still remains essentially as discussed in the original description of *I. hudsonicus* and in the key except that two additional distinctive features have been discovered. This present study is based on a much greater number of widely collected specimens than either this author or Ricker had previously been privileged to study. They include all of the specimens of *I. frontalis* and *hudsonicus* known to be present in the United States National Museum (USNM), the Canadian National Collection (CNC), Cornell, and the Museum of Comparative Zoology at Harvard (MCZ) as well as some from the Illinois Natural History Survey Collection (INHS) and from Ricker's (WER) and my personal collection. To the curators of all of these museums I am deeply indebted for the loan of specimens and permission to clear and dissect them for critical study.

The following table shows, in order of relative importance, features which distinguish *I. hudsonicus* from *I. frontalis*.

Character	<i>hudsonicus</i>	<i>frontalis</i>
Shape of lateral stylets in dorsal view.	Tapered from base to apex.	Subcylindrical for most of length; much narrower at base of subcylindrical section than is stylet of <i>hudsonicus</i> at same distance from apex.
Distance of end of posterior sclerotized support from apex of supraanal process.	.16-.24 mm.	.28-.44 mm.
Angle on posterior margin of genital lobe just above cercus.	Present	Absent
Angle at "heel" of "foot" of genital lobe.	110-130 deg., generally 130 deg., infrequently much less.	Generally 90-110 deg., infrequently more.
Length of lateral stylets.	.22-.34 mm.	.28-.40 mm.

The above features are all clearly shown in Figures 3 and 7 in the author's previous publication on *Isogenoides* except perhaps for the lateral stylets which are shown in this paper (Figs. 1 & 2) at greater enlargement to illustrate the extremes of variation in shape. The first two criteria listed in the table distinguish, easily and without exception, all of the specimens of *I. frontalis* and *I. hudsonicus* that the author has studied. The differences between their supraanal processes can usually very easily be observed even without making actual measurements. The differences between the shapes of the lateral stylets of the two species is very marked. The relative slenderness of the lateral stylets of *I. frontalis* gives them the appearance of being much longer than those of *I. hudsonicus*, although actual measurement shows this to be an illusion due to shape in some cases. The shape of the genital lobes is a very convenient character to use, since it is easily observable even in most dried specimens. It is almost always very distinctive (Figs. 1D, 2D) although extremes of variation produce intermediates between the two species.

Further evidence of specific dissimilarity of *I. frontalis* and *I. hudsonicus* is offered by two factors indicating an unlikelihood of the existence of geographical variation and resultant intermediate forms. First, the entire known range of variation of any diagnostic character in either species may occur in any one locality. Sufficient series of specimens to demonstrate this have been available from widely separated localities (Ontario, British Columbia, and Michigan). Secondly, new distributional records show that their ranges overlap along the Athabasca River in Alberta and at least approximate each other near the Great Slave Lake and in northern Michigan and New York. This is significant since the two species are as easily distinguished in the coinciding or approximating habitats as they are in widely separated regions. It is noteworthy that these data still show the range of *I. frontalis* to extend into much warmer regions than that of *I. hudsonicus*. The fact that most northerly records are those of *I. frontalis* may at first seem to conflict with the above statement. However, as Porsild (1943) has shown for birds, numerous species extend farther north along the Mackenzie River than elsewhere in Canada.

The synonymy of *I. hudsonicus* under *I. frontalis* by Ricker is based on three contentions. First, he shows that intermediate conditions occur in the shape of the genital lobes; secondly he contends that all other diagnostic characters are even more variable than the genital lobes; and thirdly that all of these variations are geographical. Concerning the intergrading nature of the genital lobes of the two species Ricker is admittedly correct (Figs. 1C, 2C). His other two contentions, however, seem to be unfounded in fact. A careful restudy of the extremes of variation of the lateral stylets and supraanal process of the two species fails to disclose a single intermediate condition in spite of the fact that this study has included many more specimens than either of us has previously studied. It is also worthy of note that a large part of the collection data included in Ricker's references to *I. frontalis* refers to specimens which were pinned or preserved in alcohol with the genitalia retracted and therefore incapable of being studied for details of either supraanal process or lateral stylets. It appears that not even a single specimen of *I. hudsonicus* listed in Ricker's references (under *I. frontalis*) was when I first saw them (after he had published his conclusions), in a condition in which these latter structures could be studied. In his contention concerning geographical variation Ricker likewise makes definite reference only to the genital lobes. It is unfortunate that in studying this problem he did not

have access to a sufficiently large number of specimens to discover the real nature of their variability. As was discussed above, from material now available it is not possible to differentiate geographical variants since it can be shown that the entire range of variation of either species may be encompassed in any one locality.

It is true that *I. frontalis* and *I. hudsonicus* are very closely related. Intermediates may yet be discovered which show them to be a single species. However, in my opinion we are obliged by the distinctness of the two forms, as now known from many specimens from widely separated localities, to maintain them as separate species.

Through an abundance of correspondence I find that Ricker does not share my opinion, nor does he agree on observed details of shapes and measurements of specimens which we have both recently studied. The eventual settlement of this interesting problem will therefore undoubtedly await more extensive collecting and the opinions of a third party.

The following data supplement my previous records. They include references to specimens of *hudsonicus* listed under *I. frontalis* by Ricker (1944) and by Frison (1942). Frison's figures (1942) of *I. frontalis* undoubtedly represent *I. hudsonicus* as judged by his drawings of the supraanal process and the genital lobes and by the present writer's examination of specimens from Frison's plesiotype locality (Michigan).

1 male, Ungava Bay, H.B.T., Can. (L. M. Turner) (CNC). 1 male, Athabasca R. near Calling R., Alberta, Can., May 21, 1914 (F. Harper) (CNC). 2 males, 2 females, Churchill, Man., Can., July 9, 1936 (H. E. McClure) (INHS). 1 male, Hunt Creek, Montmorency Co., Mich., Aug. 30–Sept. 3, 1940 (J. W. Leonard) (INHS). 1 male, Platte R., Honor, Mich., May 27, 1939 (T. H. Frison & H. H. Ross) (INHS). 1 male, Muskrat Falls, Hamilton R., Labrador, Can., July 12–19, 1919 (S. E. Arthur) (CNC).

Isogenoides frontalis (Newman)

Fig. 2.

Collection data supplementary to those listed by Hanson (1943). 2 males, Grand Rapids and down the Athabasca R., Alberta, Can., May 24, 25, 1914 (F. Harper) (MCZ and CNC). 1 male, Newgate, B. C., Can., June 17, 1927 (A. A. Dennys) (CNC). 1 male, Aklavik, N.W.T., Can., June–July 1927 (R. T. & A. E. Porsild) (CNC). 2 males, S. Nahanni R., N. W. T., Can., Aug. 1928 (F.

Hunter) (CNC and WER). 1 male, Fraser R., Agassiz, B. C., Can., May 21, 1938 (W. E. Ricker) (WER). 1 male, Nechako R., Prince George, B. C., Can., July 13-15, 1938 (W. E. Ricker) (WER). 1 male, 1 female, Nechako R., Prince George, B. C., Can., July 13-15, 1938 (INHS). 1 male, Athabasca R. between Grand Rapids and Crooked Rapids, Alberta, Can., May 26-28, 1914 (F. Harper) (CNC). 1 male, West Branch, Mackenzie Delta, Can., July 15, 1924 (W. N. B. Hoare) (CNC). 1 male, St. Laurent, Sask., Can., May 13, 1939 (L. C. Paul) (CNC). 1 male, Near Ft. Yukon, Alaska (T. E. Winekoff) (USNM). 1 male, Ft. Yukon, Alaska (previously identified as *I. hudsonicus* by Hanson, 1943). 1 male, 1 female, Snake R., Idaho, May 22, 1932 (E. Kline) (INHS). 1 male, 1 female, Corvallis, Ore., March 19, 1934 (M. A. Scullen) (INHS). 1 male, 1 female, Corvallis, Ore., April 1, 1939 (D. Polson) (INHS). 2 males, 1 female, Vantage, Wash., July 5, 1932 (G. Hoppe) (INHS).

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EXPLANATION OF PLATE VII

Fig. 1. *Isogenoides hudsonicus* specimens from Churchill, Manitoba: lateral stylets and genital lobes. Fig. 2. *I. frontalis* specimens from British Columbia: lateral stylets and genital lobes. Fig. 3. *I. zionensis* n. sp. terminalia.